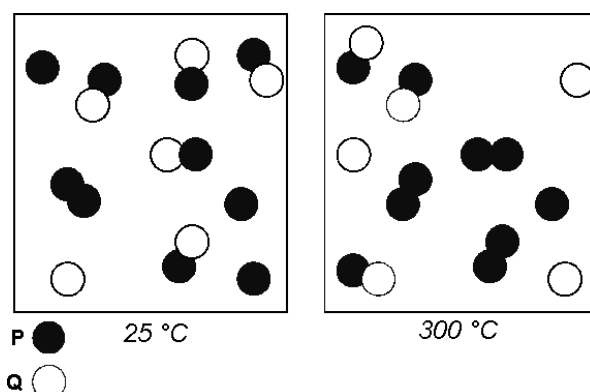


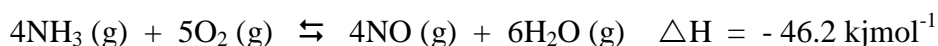
Crystal Ball questions on Interpreting equilibrium expressions using the value of K

All of the following questions have not (as yet!) appeared in the NCEA Level 2 Exams

1) The diagrams below represent equilibrium mixtures for the reaction $P_2 + Q \rightleftharpoons PQ + P$ at 25 °C and 300 °C respectively. Deduce and explain whether the reaction is exothermic or endothermic.



2) For the reaction



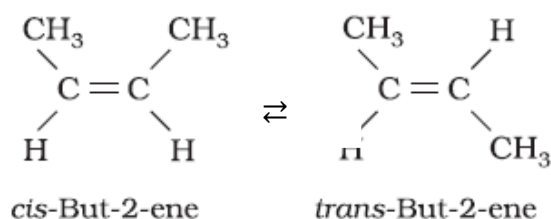
a) write an expression for the equilibrium constant

b) Calculate the value of K_c given the following equilibrium concentrations at 400 °C
[NH₃] = 0.1 mol L⁻¹ [O₂] = 0.125 mol L⁻¹ [NO] = 0.1 mol L⁻¹ [H₂O] = 0.15 mol L⁻¹

c) Discuss the effect of each of the following on the value of the equilibrium constant

- i) some product is removed
- ii) the temperature decreases
- iii) more reactant is added
- iv) the volume is increased
- v) a catalyst is used
- vi) the pressure is increased by decreasing the volume

3) The gas-phase conversion reaction between the geometric isomers cis-2-butene and trans-2-butene is represented by the equation below. The value of the equilibrium constant, K , for the reaction is 3.2 at 25 °C and 1.01325×10^5 Pa



a) In a mixture of the isomers at equilibrium at 25 °C and 1.01325×10^5 Pa, which is present at a higher concentration, cis-2-butene or trans-2-butene? Justify your answer.

b) Given that K for the reaction at 127 °C has the value of 1.3, predict whether the reaction is endothermic or exothermic. Justify your answer.

edited from reference: <http://www.glimme.net/bhs/unt09/AP-Q-2-ans.pdf>